

# Development Of Learning Competency Based Electricity In The Vocational High School

**Riana T. Mangesa**  
rianamangesa@yahoo.com

## Abstract

The purpose of this study are: to produce a competency-based learning software engineering of electrical power installations that meet the category used in a valid and effective learning in the Vocational School.

This study uses the development of research methods. Conceptually and procedures, research and development carried out referring to the model of Plomp (1997) and SCID models (2008) are summarized into four stages, namely: the initial assessment, design, realization and testing. Pre-development stage of the analysis begins with the competence of the workforce needs of electricity, competency and learning needs of schools. Identification of the work through the technical competence DACUM (Developing A Curriculum) by the experts of the specific electrical work. FGD is then performed with the involvement of educational practitioners to formulate competency profile, as something to be made SKKD development in instructional design and learning components of the device. The resulting product is validated by experts and teachers. The first assessment done through test validation by matter experts, expert research and evaluation, vocational technology education experts. Further assessment by teachers in the implementation of two trials conducted in 5 SMK, SMK 3 in Makassar and SMKN 1 Pallangga, Vocational Technology in Gowa. Learning the instrument validity test, performed by computational program package Microsoft Excel and statistical package SPSS for Windows 15.0.

The results are: (1) the electrical field of competency-based learning is embodied in the implementation manual pembelajaran and learning modules, (2) devices that meet the criteria for effective learning and practical competency-based learning is used in the electrical field in the CMS, because the process active learning, learning objectives achieved so that individual students get an average value exceeds the value of working capital.

**Keywords:** Development of learning, competence field of electricity

---

## 1. Introduction

Realization of improving the quality of vocational education continues coveted by communities, especially communities directly involved in the working world. It is expected that learners do have vocational education qualifications as a workers who have specific skills relevant to their expertise, have adaptability, and can adapt to teknologi developments. One-a-year national education development strategy 2005-2009, which set out the policy of the government, regarding the development of secondary vocational school (SMK) for the fulfillment of middle-level manpower, the comparison of the proportion of vocational plans: high school with a composition of 70: 30 a good number of schools and number of learners.

In accordance with the purpose of vocational above, the "PKL" who performed the students in the world of work, making the students have work experience, then it is assumed that the vocational school graduates will gain experience in the world of work. Kemdiknas follow-up plan, (2008) is the ratio of students to vocational, the proportion of

vocational composition: secondary school level in 2004 to 67: 33 in 2014. This policy is intended to be more output-oriented education in the workforce and meet the needs of business and industry. Incompatibility should be recognized that the issue has become a major issue in the debate between education and the workforce, both at national and regional levels. Considered to be prospective vocational school anymore, because although the world of work-oriented but not necessarily be guaranteed upon graduation, immediately getting a job, (<http://depnakertrans-depdiknas-kembangkankurikulum> berbasis-kompetensi, diakses 10/12/2009).

Muhaimin, (2009) states that employment opportunities are available but can not be filled by graduates of educational and job seekers. This is due to the lack of job competence and expertise needed labor market. This problem is supported by several findings, the results of the study Samsudi (2008), that ideally the national vocational graduates who can immediately enter the workforce of about 80-85%, but the fact that the new merged 61%. In 2006 graduated from vocational school in Indonesia reached 628 285 people, while the projection of manpower

requirements absorption or vocational school graduates in 2007 were 385 986 people (61.43%).

The same statement from the Electrical and Mechanical Association of Indonesia (AKLI) in Yogyakarta Region, stated that the number of workers certified electricity is still lacking, it is said that only with bagging a certificate, the marketability of the workforce will be increasingly taken into account, Aji Karnanto (Tribun Jogja -27 November 2011). The lack of this certified workforce, according to him because of the education system that runs for this out of sync with the needs of existing industries. The observations in the field of electrical field players and a team of certified vocational competency tests in the field of electricity Makassar, said that the curriculum is implemented in the field of electricity is still lacking, even some of the basic competencies that are considered important, not yet included in KTSP (Riana, 2010).

The phenomenon is an indication that the quality or competence of graduates do not meet the expectations of the workforce. Necessary changes in the nature of the learning achievement of targets indoktrinatif curriculum, a learning-oriented learner achievement of competencies as required in the implementation of the vocational curriculum. Operational reference very concerned about the diversity of KTSP, funding, and environmental characteristics of the area. So that the operational curriculum should be developed according to the needs of potential schools and areas, compiled by and implemented in each educational unit. The learning function is needed to help teachers implement learning.

Associated with competency-based learning process-oriented world of work, demanding implementation of innovative learning that focuses on the learner (student centered) and provide more opportunities for learners to construct knowledge independently. Opinions are more focused towards the establishment of competence by Sagala, (2010); Benny (2009) that learning is an activity of interaction with their environment, are being made to have the competence of the skills and knowledge required.

Behaviorism theory emphasizes the importance of conditioning effects in the learning situation is designed as a condition of teacher learning. Conditioning of learning by Gagne, (1972), is that learning is not a single process, learning is the mechanism by which one becomes a functioning member of society is complex. Another learning theory that can complement Behavioristic learning theory is the theory of

cognitivism, where cognitive learning theory, a theory which is based on the thought processes behind behavior change. Pioneer Jean Piaget's cognitive theory (1952), stated there are four stages of cognitive development in individuals, namely, sensory motor, pre-operational, concrete operational and operational format. Implications for learning and the material should be prepared in a concrete form to the development of life by giving students the opportunity to students to learn actively with its environment.

Behavioral changes observed and used as an indicator of what happens in the brains of students, so the emphasis in cognitive learning theory became one of the basic approaches in the process of behaviorisme. Djemari Mardapi, (2008: 103) that almost all purposes to have cognitive affective component. Affective abilities are part of the learning outcomes and has an important role in the learning process.

Even emphasized that the success of learning in cognitive and psychomotor domains is largely determined by the affective state of students. Several way that can be taken to achieve an innovative and contextual learning, such as by improving the curriculum, improvement of learning resources and so forth. But sometimes there are factors both in terms of school management, as well as in learning systems, learning in the classroom.

It is therefore necessary learning tools that can be used as guidelines for teaching and learning resources. Module that can serve as teaching material. According to Dirjen PMPTK (2008) that the module is instructional materials designed to be studied independently by study participants. Module the media for self-study because it has been equipped for self-study guide. That is, the reader can do without the presence of teaching and learning activities directly. Module is a tool or a means of learning containing materials, methods, limitations, and how to evaluate systematically designed and attractive to achieve the expected competencies in accordance with the level of complexit. A module can be said to be good and interesting if has the following characteristics: (1) self instructional, ie through one module or the learners are individual learning, do not depend on the other hand, (2) self-contained, ie, all learning kit from one unit competencies or sub competencies learned in one single module as a whole, (3) stand alone , ie, a module that was developed is not dependent on other learning kit or should not be used in conjunction with other learning (Dirjen PMPTK, 2008).

Learning approach will use the Contextual Teaching and Learning (CTL), with delivery starting in the classroom techniques, according to Nurhadi, (2004: 65), CTL learning is a process of education that aims to help students see meaning in the lesson material in a way to connect with the context of their lives daily. Santrock, (2008:8) contextual learning is rooted in Dewey progressivisme theory and research findings that show that students will learn best when what is learned associated with they know and when they are actively learning itself.

Based on the description on the background of the problem, some problems can be identified, namely: (1) the emergence of areas of expertise incompatibility issue affects the quality of vocational workforce that reflects the quality of Indonesia, as a result the number of certified workers are still lacking electricity, (2) vocational curriculum for the eyes lesson is simple to install electrical installations of buildings have been revised through the KTSP, but regarded by the world of work is still lacking electricity, (3) the plan RPP, an indicator of competence and basic competences required the workforce, have not been met, (4) much-needed development of appropriate learning tools with competency-based learning field of electricity, (5) teachers need is a means of learning modules containing instructional materials in electrical competency-based learning.

The review in this study is limited in vocational technology group electrification program, the field of power engineering installations, an interesting problem to be developed according to this research topic, namely: development of curriculum (KTSP) based on competency-based learning SKKD in the field of electricity. The purpose of this study is to find a learning device (learning modules) on the Electricity Sector KTSP models and used appropriate vocational learners in the field of electrical installation expertise.

## 2. Research Methods

Learning devices developed in this study belong to the type of research & development (Research & Developmental). Richey and Nelson, (1996: 122) states that through the research process-oriented product development, the most important thing is the process of development is described as precisely as possible and the final product were evaluated. Development patterns that are used refer to the model Plomp, (1997: 5). Plomp consists of five distinct phases in the process of resolving the problem, as described into

the following five stages: (1) the initial investigation stage, (2) Design, (3) Phase realization / construction, (4) testing, evaluation and revision; (5) Implementation. Description of the activities in each phase as follows: (1) Preliminary Phase Investigation, the most important thing in this stage is to identify and plan activities to define the problem, (2) Design Phase, the planning is done at this stage that aims to design problem solving, involves a systematic process to divide the large problem into problems of small problems, (3) Realization Phase / Construction, built a prototype at this stage, the main design is based on a preliminary draft document, (4) Phase test, Evaluation, and Revision, at this stage the most important thing is to consider the quality of the design components learning will be developed, (5) Implementation phase, at this stage, activities to implement the designs that have been evaluated and revised. This activity relates to the pilot phase to validate the developed device. The five steps are presented in schematic form in Figure 1:

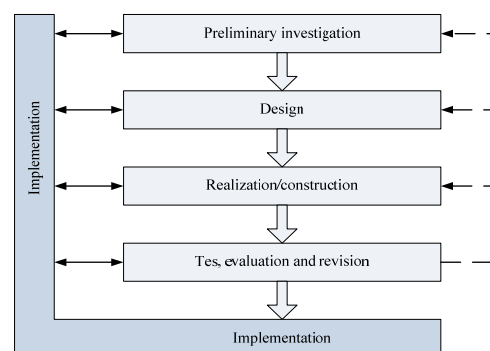


Figure 1. The general model of educational problem solving (Plomp, 1997)

## 3. Discussion

As was explained above that the development activities consist of two main activities, namely: (1) the research or pre-development and (2) development activities, the results of research studies according to the procedure outlined as follows:

### 3.1 Pre-Development Activities

Initial assessment phase of the information gathering stage is mainly concerned with the electrical engineering curriculum competencies and gathering information from the world of electrical work. Through these stages are found job competence in the electrical engineering. With the

identification of competencies through workshops involving expert worker of Electrical and Mechanical Association of Indonesia (AKLI) found Makassar, competency profiles installing electrical installation simple building, which belongs to a class of low voltage, power 450 VA up to 197 kVA, which can be seen in Table 1.

Table 1. Competency profiles  
Simple Installation Installing Electrical Building

No	Basic Competencies
1	Application of Occupational Health and Safety (K3)
2	Electrical of single phase installation
3	Single-phase circuit breaker panel
4	Installation Grounding

Workshop Januari 2011

Competency profiles are then analyzed according to indicators of achievement of competencies which is used as the source of information for the preparation of Questionnaire Identification of Learning Needs in the School. Questionnaire was distributed to schools, which responded by learners and teachers. The results of the questionnaire responses of the identification of learning needs in schools, then studied by analyzing, classifying appropriate verb to each competency element instructional objectives into three domains of learning, namely cognitive, affective and psychomotor, according to Blooms taxonomy of learning objectives (1989), and tabulated in Table matrix Competency Profile. The next stage is to conduct focus group discussions (FGD) conducted with education practitioners. The results of a source of information for designing a learning device. So that the results of initial development phase is the prototype of the electrical engineering, in the form guide the implementation of learning, evaluation tools and learning modules.

The next stage of realization, at the conceptual stage of validation is performed on the initial prototype. In order to validate conceptual models, the first step was to show the validator, which developed the initial prototype. Composed of five experts (expert judgment) and education practitioners.

Validator was then asked to give his assessment by filling in the instrument that has been given to him. Requesting consideration as a matter experts and education practitioners, about the feasibility of the instruments that had been developed, including the design criteria of success

(Rubric), the design of learning tools and assessment instruments. Validator assessment results in the form of the assessment form were analyzed using descriptive statistics and computational data analysis performed with the aid of program package Microsoft Excel and SPSS statistical package for Windows. To measure the level of inter-rater agreement (inter-rater reliability) of the validation results of the research instruments, statistical analyzes used Cohen's Kappa Coefficient, (Nitko & Brookhart, 2007: 80). The instrument is said reliable if the coefficient reliability  $(r) \geq 0.70$ .

### 3.2 Development activities

Activities of product testing is done two times intended to collect data on product quality, which is a series of verification activities and revisions to the school to find effective and practical products. Test activities carried out twice, which consist of small groups and test expanded. Small group of test is a test that applies to a small group (one class) samples on the actual situation.

Through test involving a small group of twenty-eight (28) of the students and two teachers in the study, as subjects try, test activities performed four times with the use of four learning modules. Assessment criteria used are the assessment scores ranging from one to score four score, and then categorizes the corresponding score value. According Suharsimi Arikunto, (2004: 32) by using the assessment scores, and then categorizes scores into categories of assessment, will avoid the entry of any element of subjectivity in the self-appraisal, because it follows the assessment criteria, point by point is fundamental to a personal decision. After implementation of the testing is complete, the evaluation conducted through focus group testing results, along with experts and practitioners pendidikan. Saran-advice that appears in the FGD then be reviewed and analyzed, a repair material that is ready to be tested on a model test of the expanded groups on three different schools as a subject.

The final product of this development a learning device. A competency-based learning products electrical fields, which produce the development of learning tools that meet the category of effective and practical for use in learning. The realization that the implementation guidance and learning tools in the form of learning implementation plan (RPP) and rubric assessments, learning modules and assessment instruments.

#### 4. Conclusion

Based on the development and review of the final product which has been described in the previous section, then the conclusion is the finding in this study as follows: Research, development, is a procedure in developing learning tools in the field of electricity. Through the procedure of identification of learning needs and competency, competency matrix is found, then used in the validation of FGD material to formulate standards of competence profiles and competence base (SKKD) is needed in putting up the building electrical installation is simple. The resulting learning devices are: (a) learning guide, containing, among others, background, structure and components, guidelines for implementation of learning, competency standard profile set up a simple building electrical installations, supporting the theory, assessment guidelines, (b) the learning device, namely ; lesson plans, learning modules, (c) the evaluation of the scoring rubric and competency assessment tools. To determine the quality of the learning models have been developed, initial procedure performed on the conceptual validity of the test. To measure the level of inter-rater agreement (inter-rater reliability) of the validation, the validation results were analyzed using SPSS statistical program: Coeffisien Cohen's Kappa, which is said to be reliable on the coefficient ( $r \geq 0.70$ ). The results of validation shows the results valid and reliable, so that all the feasible and can be used for the development of data capture. Based on the evaluation of data on the test results both in test I (small groups) and in test II (extended test), it was found that the learning tools are developed, effective and practical criteria are used in learning for students implimentasi vocational fields of electrical installation expertise.

#### REFERENCES

- Anderson, L.W. & Krathwohl, D.R. (Eds.) (2001). a taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives. New York: Addison Wesley Longman.
- Bloom S.B., Krathwohl,D.R., Marsia,B.B. (1964). taxonomy of educational objectives: New York: Longman.
- Bloom, Madaus & Hasting. (1981). Methods grading in summative evaluation. New York: McGraw-Hill.
- Borich, Gary D.(2007). Effective teaching methods: Research-Based Practice. Sixth Edition. New York: Pearson Prentice Hall.
- Borg, W.R., & Gall, M.D. (1983). Educational research: An Introduction (4<sup>nd</sup> ed). New York: Longman. Inc.
- Brooks, J.G & Brooks, Martin G. (1993). In research of understanding: The case for constructivist classrooms. Virginia: Association for Supervition and Curriculum Development
- Clarke, L., & Winch, C. (2007). Vocational educational: International approaches, developments and systems. Madison Avenue, New York. Routledge Taylor & Francis Group, an informa business.
- Cohen R.J., & Swerdlik, M.E. (2004). Psychological testing and assessment; An introduction to test and measurement. (6th ed.). Boston: Illinois State University. McGraw Hill.
- Depdiknas. (2003). Undang-undang RI Nomor 20 tahun 2003, tentang Sistem Pendidikan Nasional.
- (2008). Peraturan pemerintah RI Nomor 19 tahun 2005, tentang Standar Nasional Pendidikan.
- (2008). Penulisan modul. Direktorat tenaga kependidikan.Dirjen PMPTK. Jakarta : Departemen Pendidikan Nasional.
- (2009). Pembangunan pendidikan SMK. Jakarta. Direktorat Jendral Manajemen Pendidikan Dasar dan Menengah.
- Dikmenjur,Trans-SKN. (2006). Informasi standar kompetensi nasional. Jakarta. Disajikan Sebagai Materi Sosialisasi Standarisasi & Sertifikasi Kompetensi.
- (2007). Penetapan standar kompetensi kerja nasional indonesia sektor ketenagalistrikan bidang instalasi pemanfaatan tenaga listrik. Jakarta. Keputusan Menteri.
- Direktorat Pendidikan SMK. (2008). Peran SMK dalam mendukung pertumbuhan ekonomi daerah. Jakarta: Departemen Pendidikan Nasional
- Erman Suherman (2008). Model belajar dan pembelajaran berorientasi kompetensi peserta didik. Hasil Penelitian tidak Dipublikasikan. Bandung. Universitas Pendidikan Indonesia.
- Finch, Curtis R., & Crunkilton, John R. (1999). Curriculum development in vocational and technical educational: Planning, content, and implementation. London: Allyn and Baccon.
- Gagne, Robert M. (2005). Principles of instructional design. New York: Wasdworth Publishing Co.
- (1992). The conditions of learning. Orlando: Harcourt Brace Jovanovich College. Publishers.
- Gay, L. R. (1990). Education research, competences analysis and application. Third edition. Singapore: Macmilan Pub.Co.
- Hamalik, O. (2007). Manajemen pengembangan kurikulum. Bandung: Remaja Rosdakarya.
- (2008). Manajemen pelatihan ketenagakerjaan pendekatan terpadu Jakarta: PT Bumi Aksara.
- Heinich, Robert. (1996). Instructional media and technologies for learning. New Jersey: Englewood Cliffs, Prentice-Hall, Inc.
- Joko Sutrisno. (2010). Garis-garis besar program pembinaan SMK tahun 2010. Jakarta: Direktorat Pembinaan SMK.
- (2010). Revisi implementasi KTSP tahun 2008. Jakarta: DPSMK.

- Joyce, B & Weil, M. (2004). *Models of teaching*. Seventh Edition. Boston New York San Francisco : Pearson Education, Inc.
- Majid, Abd. (2008). *Perencanaan pembelajaran*. Bandung: Remaja Rosdakarya Offset.
- Mardapi, Djemari. (2008). *Teknik penyusunan instrumen tes dan non tes* Yogyakarta: Mitra Cendikia Press.
- (2004). *Penyusunan tes hasil belajar*. Yogyakarta: Program Pascasarjana Universitas Negeri Yogyakarta.
- Mulyasa, E. (2007). *Kurikulum tingkat satuan pendidikan*. Bandung: Remaja Rosdakarya.
- (2005). *Menjadi guru profesional menciptakan pembelajaran kreatif dan menyenangkan*. Bandung: Remaja Rosdakarya.
- Muklas, Samani. (2008). *Pengembangan dan peningkatan kualitas pembelajaran*. Jakarta: Direktorat Ketenagaan. DJPT. Depdiknas.
- Munthe, B. (2009). *Desain pembelajaran*. Yogyakarta : Pustaka Insan Madani
- Mukminan, (1998). *Belajar dan pembelajaran*. IKIP Yogyakarta: Pusat Pengembangan Pendidikan Profesi Guru.
- (2004). *Desain pembelajaran*. Yogyakarta: Program Pasca Sarjana UNY
- Norton, E. Robert. (2008). *Developing a curriculum handbook*. Third Edition. Columbus, Ohio: The Ohio State University, Center on Education and Training for Employment College of Education & Human Ecology.
- Pardjono, dkk. (2003). *Pendidikan kejuruan dengan kurikulum berbasis kompetensi berorientasi kecakapan hidup*. Makalah disampaikan dalam Lokakarya Pembelajaran dengan KBK Berorientasi Kecakapan Hidup. Tanggal 29 dan 30 April 2003 di FT-UNY.
- Pardjono. (2008). *Urgensi penerapan konstruktivisme dalam pendidikan Kejuruan*. Yogyakarta: Pidato Pengukuhan Guru Besar dalam Bidang Pendidikan Teknik Mesin. Universitas Negeri Yogyakarta.
- Piaget, Jean, (1952). *The psychology of intelligence*. London: Routledge, and Kegan Paul, co.
- Plomp, Tj. (1997). *Educational and training system design*. Netherlands: University of Twente Faculty of Educational Science and Technology Enschede.
- Sagala, S. (2010). *Konsep dan makna pembelajaran: Untuk membantu memecahkan problematika belajar dan mengajar*. Bandung: Alfabeta.
- Saifuddin Azwar. (2009). *Reliabilitas dan validitas*. Yogyakarta: Pustaka Pelajar.
- Santrock, John, W. (2008). *Educational psychology and technology 2<sup>nd</sup> edition* (terjemahan Tri Wibowo, BS). Texas: McGraw-Hill Company, Inc. (buku asli terbit tahun 2004)
- Sarbiran. (2008). *Model mutu pendidikan: Profesionalitas terpadu*. Makalah disajikan dalam seminar nasional Paradigma Baru Mutu Pendidikan di Indonesia. Yogyakarta: Lembaga Penelitian UNY, Sertifikat ISO 9001:2000, SICS: QSC 00692.
- (2002). *Optimalisasi dan implementasi peran pendidikan kejuruan dalam era desentralisasi pendidikan*. Pidato Dies Natalis XXXVIII Universitas Negeri Yogyakarta.
- Shambaugh, N. & Magliaro, G.S. (2006). *Instructional design a systematic approach for reflective practice*. Boston: Pearson Educational Inc
- Slamet, PH. (2005). *Pengembangan kapasitas untuk mendukung desentralisasi pendidikan kejuruan*. Pidato pada Rapat Terbuka Senat Universitas Negeri Yogyakarta.
- Soenarto. (2003). *Kilas balik dan masa depan pendidikan dan pelatihan kejuruan*. Pidato Pengukuhan Guru Besar. Yogyakarta: UNY
- Suharsimi, Arikunto. (1990). *Manajemen pengajaran secara manusiawi*. Yogyakarta: PT Rhineka Cipta
- Suharsimi Arikunto & Lia Yuliana. (2008). *Manajemen pendidikan*. Yogyakarta: Aditya Media bekerjasama dengan Fakultas Ilmu Pendidikan (FIP) UNY.
- Sukamto. (1988). *Perencanaan & pengembangan kurikulum pendidikan teknologi & kejuruan*. Jakarta: Departemen Pendidikan & Kebudayaan.
- Sukamto. (2001). *Perubahan karakteristik dunia kerja dan revitalisasi pembelajaran dalam kurikulum pendidikan kejuruan*. Pidato pada Rapat Terbuka Senat Universitas Negeri Yogyakarta.
- Sukardi. (2003). *Metodologi penelitian pendidikan*. Yogyakarta: Bumi Aksara
- Spencer L.M., & Spencer S.M., (1993). *Competence At Work*. New York: John Wiley & Sons. Inc.
- Wardiman Djojonegoro. (1998). *Pengembangan sumber daya manusia melalui SMK*. Jakarta: PT. Jayakarta Agung Offset.
- Wina Sanjaya. (2009). *Perencanaan dan desain sistem pembelajaran*. Jakarta: Kencana Prenada Media Group
- Woolfolk, Anita E. & Lorraine McCune Nicolich. (1984). *Educational Psychology for Teachers*. New Jersey: Prentice-Hall Inc.
- Xu Jinjie. (2007). *Work-based learning helps the youth development*. China: East China Normal University.
- Zamroni (2004). *Refleksi pelaksanaan KBK pada tingkat sekolah menengah atas*. Makalah disajikan pada seminar nasional 17 Mei 2004 dalam rangka Dies Natalis XL Universitas Negeri Yogyakarta.